

# Track reconstruction efficiency

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Tralgo Meeting

[http://www-d0.fnal.gov/~rakitin/d0\\_private/tex/2006.Mar.08.Tralgo/tr.pdf](http://www-d0.fnal.gov/~rakitin/d0_private/tex/2006.Mar.08.Tralgo/tr.pdf)



# Tracking efficiency study:



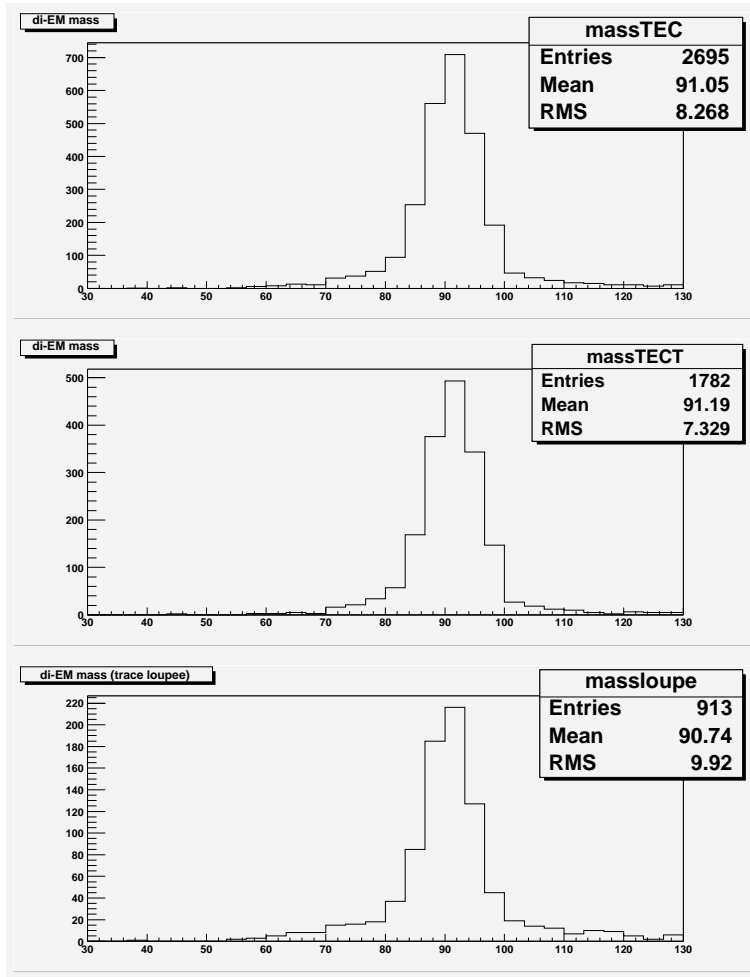
Reminder: I use Jan Stark's data sample  $Z \rightarrow e^+e^-$ :

- $117 \text{ pb}^{-1}$  taken Sep 2002 - Jun 2003
- Cuts:
  - $\text{iso} < 0.15$
  - $\text{emfrac} > 0.9$
  - $p_t > 25 \text{ GeV}/c$
  - $m(ee) > 30 \text{ GeV}/c^2$
- Fire at least one of cal. triggers: 2EM\_2MD12, 2EM\_2MD7, EM\_HI
- No track triggers – to avoid bias
- One EM cluster in CC (“tag electron”) – must have matching track
- Another EM cluster in end-caps (“probe electron”) – does not have to have matching track



# Tracking efficiency study:

The plots of di-EM mass (© Jan Stark):



- Upper: all events
  - Middle: probe electron has matching track (~ 66%)
  - Lower: probe electron has no matching track (~ 34%)
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- **Problem:** matching track isn't reconstructed for probe electron in one-third of cases
  - **Resolution:** slight change of reconstruction algorithm may help

Method of study:

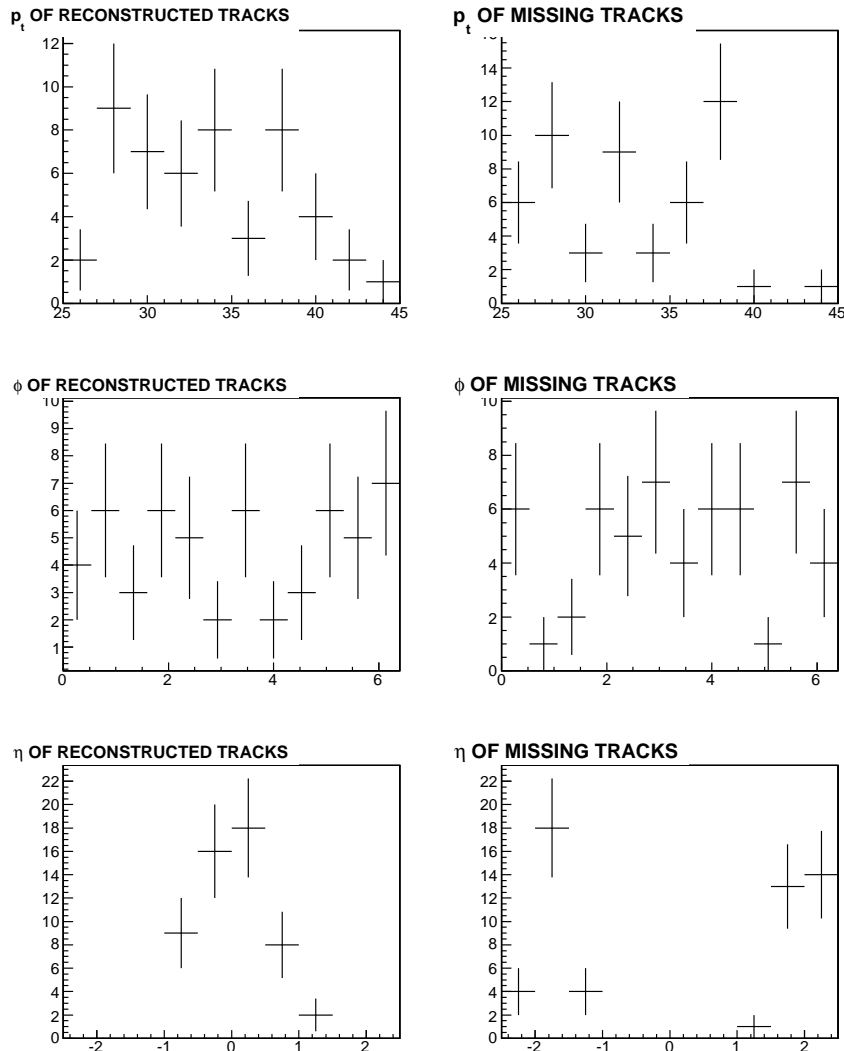
- Shoot an imaginary track from PV to EM cluster
- See which hits are close to it
- Understand why they were not composed into track



# $p_t, \phi, \eta$ distributions:

See if geometry is different for reconstructed and missing tracks:

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- The  $p_t$  and  $\phi$  distributions of reconstructed and missing tracks look similar
- The  $\eta$  distributions are different by construction:
  - “Tag electron” must be in CC
  - “Probe electron” must be in end-caps

No significant difference observed

# Reminder of proposed change in algorithm:

- All the tracks having 3+ hits in SMT Barrels are reconstructed (“3-hit req.” of current algorithm)
- Non-reconstructed tracks can be divided into 4 categories:
  - ☞ Tracks with
    - either 2 hits in SMT barrels and 1 in F-disks
    - or 1 hit in SMT barrels and 2 in F-disks
  - ☞ Tracks with 2 hits in SMT and 4+ in CFT
  - ☞ Tracks with hits being a little outside of “standard”  $3\sigma$  window
  - ☞ Tracks with too few hits to be reconstructed

By changing tracking algorithm we can reconstruct first three categories

Combinatorics will increase  $\Rightarrow$  how much time will it take to process?

$\Rightarrow$  Still to be investigated

First two changes are currently under investigation

# Results

SMT hits in barrels and disks may follow different patterns:

- 2 in barrels + 1 in disk
- 1 in disk + 2 in barrels
- 1 in barrels + 1 in disk + 1 in barrel

All these configurations should be properly taken into account

I wanted to describe the results, but found a bug in my code last night...



# Conclusion



Majority of the missing tracks from the “probe” electrons can be reconstructed by slight variations of the algorithm:

- Require 3+ hits in **both** SMT barrels and disks, not only in barrels  
⇒ see how much time all combinations will take to process
- Allow for 2 hits in SMT (barrels and disks) if CFT has 4+ hits
- Allow hits to be further than  $3\sigma$  away (maybe only for high- $p_t$  tracks?)

## Plans:

Still need

- to implement algorithm changes
- to see how much they affect tracking efficiency
- to see how much time it takes to process